

BC DAM SAFETY PROGRAM ANNUAL REPORT 2013/2014

SUMMARY

There are approximately 1,570 water supply dams in British Columbia that are subject to the B.C. Dam Safety Regulation of the *Water Act* and are regulated by the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) Dam Safety Program. This report addresses these dams, which are constructed for the purpose of diversion and storage of surface water and require a licence under the *Water Act*. This includes, for example, reservoirs for hydro-electric power generation, agricultural irrigation, industrial use, municipal water supplies and domestic use as well as structures that regulate lake or river levels.

Mine impoundments such as tailings storage facilities, sediment control or sludge ponds, and diversion channels are regulated under the *Mines Act* and the Health, Safety and Reclamation Code for Mines in B.C. and are therefore not included in the report.

Similarly, information about dikes, dugouts and other structures that are not licenced under the *Water Act* are not included here.

This annual report is a commitment of the B.C. Government following the 2010 Testalinden Dam failure and summarizes the achievements and ongoing improvements to the MFLNRO Dam Safety Program for 2013/14. The highlights of the program for the year include:

- The provincial audit target of 127 dams was exceeded by 26%.
- Staff reviewed 51 projects for new dams, rehabilitation of existing dams and dams to be removed, which was 64% more than last year. There were also 19 reviews of dams in the construction phase, which was 58% more than last year.
- Dam safety officers responded to issues reported with dams including two dam failures, two dam alerts, one dam incident and two reports of incidents for dams where no action was required.
- Sixty dam owners or their representatives received training from dam safety staff.
- Twenty-six MFLNRO staff across the province received dam safety training to assist in assessments and investigations of non-compliance with the B.C. Dam Safety Regulation.
- The annual B.C. Dam Safety Regulation compliance forms were received from owners of 97% of the 345 high, very high and extreme failure consequence classification dams in the province. Of these, dam owners reported that 92% of the dams were inspected by the owner.
- Of the high, very high and extreme failure consequence classification dams, 65% reported completing the required dam safety reviews, while 96% of the remaining dam owners have at least initiated their dam safety reviews.
- Eighty-one percent of water supply dams can be viewed on [Google Earth and Data BC](#).
- The dam registry has been modified significantly over the past year to improve dam information management and to allow better tracking of dam owner compliance by ministry staff.

- Dam safety staff participated in a number of opportunities for professional development and to implement improvements to dam safety program delivery. Some dam safety officers also participated in external training provided by other jurisdictions and professional associations to increase their understanding of current and new dam safety practices.

INTRODUCTION

This report summarizes the activities undertaken by the dam safety program and reports dam owner compliance for the period April 1, 2013 to March 31, 2014 for dams regulated under the *Water Act*, B.C. Dam Safety Regulation. The report also provides updates on continued progress toward addressing the deputy solicitor general's remaining recommendations following the Testalinden Dam failure in 2010.

Of the approximately 1,570 regulated dams in B.C. at the time of writing the report, 1,504 are in active operation ranging in size from some of the largest structures in Canada, such as the Mica Dam which generates hydroelectric power, to small earth-filled dams that create water storage for domestic use. There are an additional 66 regulated dams that are non-operational; these include dams that are proposed (not constructed) or where the water licence has been abandoned but the dam not yet decommissioned. For the purposes of this report unregulated dams are those that do not meet the criteria specified in the Regulation (dam height, volume of water stored or failure consequence classification) or do not have a water licence and are therefore unauthorized. Breached dams include those intentionally breached for decommissioning and those breached by dam failure. Dam safety program staff deal with unregulated water supply dams as needed to ensure public safety, protect the environment, cultural values, infrastructure and the economy and to ensure compliance with the B.C. Dam Safety Regulation when relevant.

The Dam Safety Section in Victoria has responsibility for the administration of the provincial dam safety program and regulation of most dams greater than nine metres in height (also known as major dams). Dams less than nine metres high comprise the regional component of the dam safety program and are administered by regional dam safety officers. Each dam safety officer is responsible for a portfolio of dams. Staff support to the program is also provided by the ministry's compliance and enforcement branch and other MFLNRO staff, in addition to partner agencies such as Emergency Management BC.

Impoundment structures such as dugouts which contain surface runoff, snow melt, direct precipitation or ground water are not included in this report as they are not regulated under the *Water Act*. Mining structures that do not require a water licence, such as tailing ponds are also excluded as they are regulated under the *Mines Act* and overseen by the Ministry of Energy and Mines.

All dam owners in British Columbia are legally responsible for the operation, inspection and maintenance of their dams to minimize risk to the public, the environment and the economy. To ensure that dam owners are aware of and in compliance with the regulation, dam safety officers conduct audits of dam owners' safety programs, provide education and awareness to dam owners and maintain information on each of the dams in the provincial dam registry. Dam safety officers also review and approve project plans for new dams, the rehabilitation of existing dams or the removal of dams as well as respond to emergencies and situation call-outs. Each year the owners of dams classified high, very high and extreme are required to complete and return B.C. Dam Safety Regulation compliance forms. The responses help

determine if the dams are being inspected and maintained by the dam owner, as per the regulation, between audits conducted by the dam safety officers.

STATUS OF MFLNRO'S RESPONSE TO DEPUTY SOLICITOR'S 2010 RECOMMENDATIONS

Since 2010/11, MFLNRO had made substantial progress in responding to recommendations in the July 2010, Deputy Solicitor's report regarding the Testalinden Dam failure and British Columbia's Dam Safety Program. Much has been done since then to improve the Dam Safety Program, and this progress is reported in previous annual reports. In future, ongoing progress with these recommendations will be reported under program accomplishments as these activities have become integrated into the program. In 2013/14, MFLNRO continued with meeting its commitments in the remaining areas:

1. *Rapid Dam Assessment (Recommendation #8)*: During the 2010 Rapid Dam Assessment 473 dams were identified as requiring non-urgent follow-up. Eight of these were reviewed in 2013/14 by MFLNRO regional dam safety staff. Work continues on a priority basis to resolve the issues associated with these dams, such as vegetation management, redesigning dams, breaching or decommissioning, planning for dam removal and completing dam safety reviews. The Goertzen Pond Dam owner in the Okanagan, for example, was issued an order to breach the dam to lower water levels and make it safer.
2. *Consistent oversight and regulation of all water related structures (Recommendation #11)*: At present, only those dams meeting the definition in the B.C. Dam Safety Regulation are under the purview of the Dam Safety Program. Certain structures such as some types of dugouts and mine impoundments are not subject to this regulation. For example, the Ministry of Energy and Mines has oversight over tailings storage facilities, diversion channels, sediment control ponds, sludge ponds and other similar impoundments and diversions on mine sites in British Columbia. These are regulated under the *Mines Act* and Health, Safety and Reclamation Code for Mines in B.C. and are required to meet the criteria provided in the Canadian Dam Association, Dam Safety Guidelines. In some instances, impoundments or diversions on a mine site require a water licence under the *Water Act*. The roles and responsibilities for the regulation of these structures are defined in the [Memorandum of Understanding](#) updated in January 2014 by the ministries of Environment, Forests, Lands and Natural Resource Operations and Energy and Mines. The Ministry of Environment and MFLNRO have developed *Water Act* policy on authorization requirements for dugouts created for storing water supplied from a stream or constructed within a stream channel. Dugouts that are filled and store water from unconsolidated surface runoff or ground water are currently not subject to the *Water Act*.
3. *Reviewing record keeping practices (Recommendation #1)*: Accurate and complete dam safety records are required to allow ready access to information about any dam in British Columbia at any time. To ensure that dam safety officers utilize the dam registry to record appropriate dam information, annual audits are done of some representative parameters in the registry. A review of the 2013/14 data associated with the six parameters previously reported reveals progress by dam safety staff in updating some types of data and not with others, possibly reflecting the

priority placed on information relevant to a dam owner's compliance with the regulation (Figure 1). The data recorded for each dam depends on its failure consequence classification. For example, gross freeboard, defined as the vertical distance between the maximum normal water elevation and the crest of the dam, is not entered for low failure consequence dams. Because low failure consequence dams comprise about 42% of the regulated dams in B.C., the lack of updates to this one parameter could skew the results. For regions with large numbers of dams, staff are challenged to maintain and update dam information in the registry; therefore, updating certain information regarding low failure consequence dams is a lower priority than other activities. On the other hand, failure consequence classification is a key piece of information and over the past three years this has improved from 92% to 98%. The six parameters currently used to assess record-keeping practices will be revisited to select indicators that better assess progress by dam safety officers to improve tracking of critical information about dams in their portfolios.

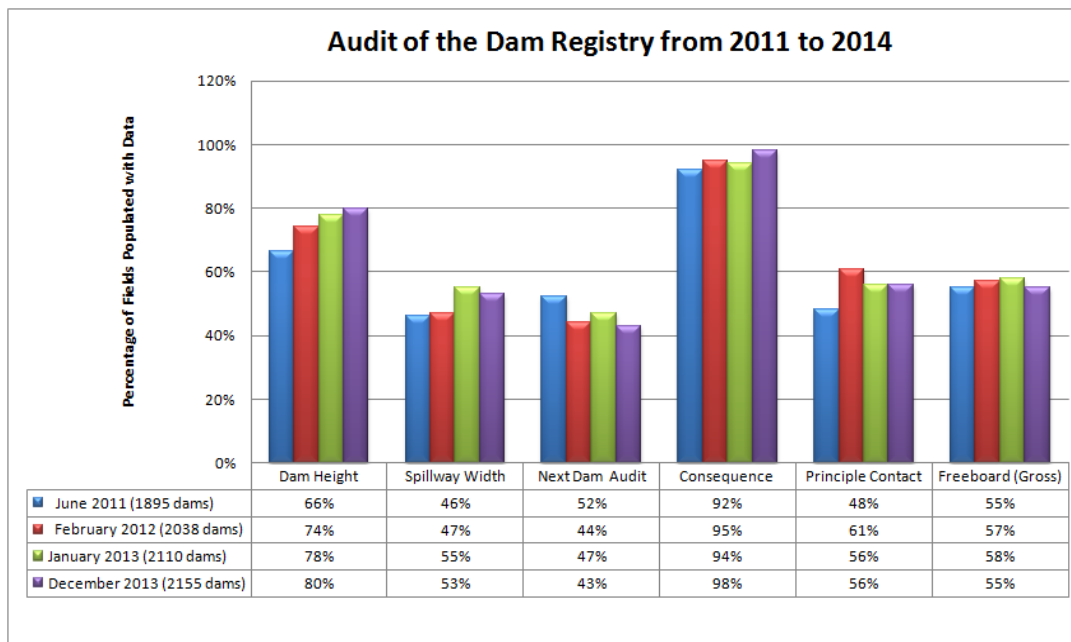


Figure 1: Audit of six dam safety parameters in the dam registry as a measure of progress in updating the database by dam safety officers from 2011 to 2014.

4. *Continue building a robust Dam Registry (Recommendation #9): a*

PROGRAM ACCOMPLISHMENTS

In 2013/14, the Dam Safety Program had many accomplishments, including:

Education and Awareness

The Dam Safety Program has a robust education and awareness program for dam owners with both formal training in workshops as well as informal training provided when dam safety officers audit dams with dam owners. For example, one of the Thompson/Okanagan Region dam safety officers trained

three members of the Neskonlith Indian Band to undertake formal inspections of their dams. Victoria dam safety staff continue to work jointly with regional dam safety officers when more formal training is delivered to dam owners and government staff in their region. Six provincial government employees from the Ministry of Transportation and Infrastructure, Ministry of Environment and MFLNRO were trained as “dam owners” on a one-day course for inspection and maintenance of dams. This year a total of 57 participants attended dam owner workshops in Langford, Fort St. John and Penticton, sponsored by the B.C. Water and Waste Association or the Water Supply Association of B.C. and instructed by Dam Safety Program staff.

Additionally, staff provided dam safety presentations to stakeholders at several meetings including those with the City of Nanaimo, Dunalter Lake (near Houston) and the City of Prince Rupert. Staff continue to meet with these groups as dam owners make key decisions regarding their dams. Annual meetings were held by dam safety section staff and the comptroller of water rights with large dam owners, such as BC Hydro and Rio Tinto Alcan, to discuss their ongoing dam safety programs and any current dam safety issues. Staff also continue to collaborate with stakeholder groups such as Ducks Unlimited (Canada) Ltd. in the design, management and decommissioning of dams. Internally, in 2013/14, a total of 26 ministry staff including new dam safety officers, natural resource officers and water authorization staff received training in various aspects of dam safety related to their work.

Outreach and Professional Development

In 2013/14, dam safety staff continued to collaborate with their counterparts in other jurisdictions, industry and professional associations on developing dam safety practices. The Professional Practice Guidelines for Dam Safety Reviews, jointly developed by MFLNRO and the Association of Professional Engineers and Geologists of B.C. (APEGBC), were introduced at the Canadian Dam Association’s Annual General Meeting in Montreal. These guidelines are available on the [APEGBC](#) and [BC Dam Safety websites](#) and were developed to establish the standard of practice to be followed by professional engineers when carrying out dam safety reviews in B.C.

Last year, a formal training and education plan was developed to identify opportunities for dam safety staff across the province to access webinars, distance education, seminars and other training provided by other jurisdictions and dam safety-affiliated associations. Through these opportunities, dam safety officers have participated in various technical webinars provided by the Association of State Dam Safety Officials (ASDSO) and seminars with APEGBC. In the last year, other dam safety staff have advanced their knowledge from their participation at the ASDSO regional conference, the International Commission on Large Dams conference in Seattle and the Centre for Energy Advancement Through Technological Innovation workshop in Vancouver.

At the end of March 2014, the annual Dam Safety Program Community of Practice meeting in Abbotsford was held over two and a half days providing the opportunity for dam safety and other government staff to discuss and work collaboratively on common dam safety concerns, while being informed by subject matter experts from BC Hydro, Ducks Unlimited (Canada) Ltd., MFLNRO water stewardship branch and the Ministry of Agriculture.

B.C. Dam Safety Regulation Compliance Reporting

Under the B.C. Dam Safety Regulation, owners of dams with high, very high and extreme downstream failure consequence classifications are annually required to report for each dam whether they have:

1. Completed the required annual inspections and conducted regular site surveillance;
2. Had a dam safety review completed by a qualified professional engineer;
3. A current operations, maintenance and surveillance manual;
4. An updated emergency preparedness plan;
5. Observed and determined whether there had been any downstream land use development that might affect the failure consequence classification of the dam; and
6. Identified any new dam safety concerns that have not previously been reported.

The annual report submitted by the dam owner provides valuable insight into whether the dam owner is in regulatory compliance between audits, which dam safety officers undertake every five years for dams with high, very high and extreme consequence classifications.

Since 2006, annual reporting by dam owners has improved substantially. Total returns in each of the last three years are above 95% (Figure 2). These increases were a result of efforts made by Dam Safety Program staff to directly contact individual dam owners to ensure they returned their compliance forms.

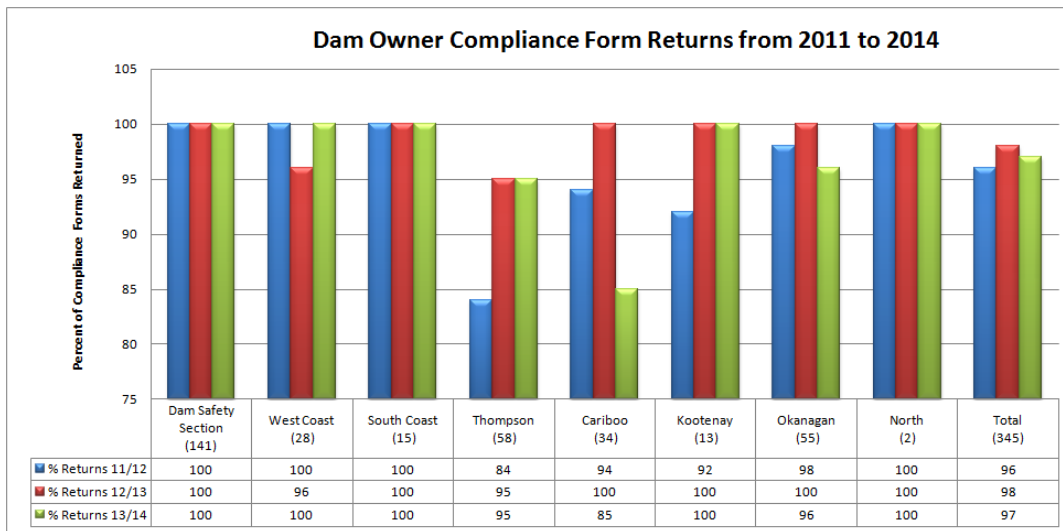


Figure 2: Percent of dam owners returning the completed dam inspection compliance forms. (Note: numbers in brackets are the total number of high, very high, and extreme failure consequence classification dams in each administrative unit for 2013/14.)

For 2013/14, a new compliance reporting strategy was introduced to reduce staff work load without compromising dam owner compliance. With the support of the compliance and enforcement branch, dam owners were advised that enforcement measures under the *Water Act* could be undertaken if they did not return their completed forms. By the January 31 due date, 97% of the forms were completed and returned by the owners of 345 with high, very high and extreme consequence classification dams.

Returned forms indicated that the percentage of dams where owners had completed the required formal inspections decreased from 98% in 2012/13 to 92% in 2013/14 (Figure 3). There was a decrease in

the number of dam owners who had completed the required inspections from the previous year in the Thompson and the Cariboo regions but an increase with the West Coast, South Coast and the Okanagan regions. Where dam owners are not meeting their obligations, staff follow-up to ensure dam owners understand the regulatory requirements, including the mandatory formal inspections.

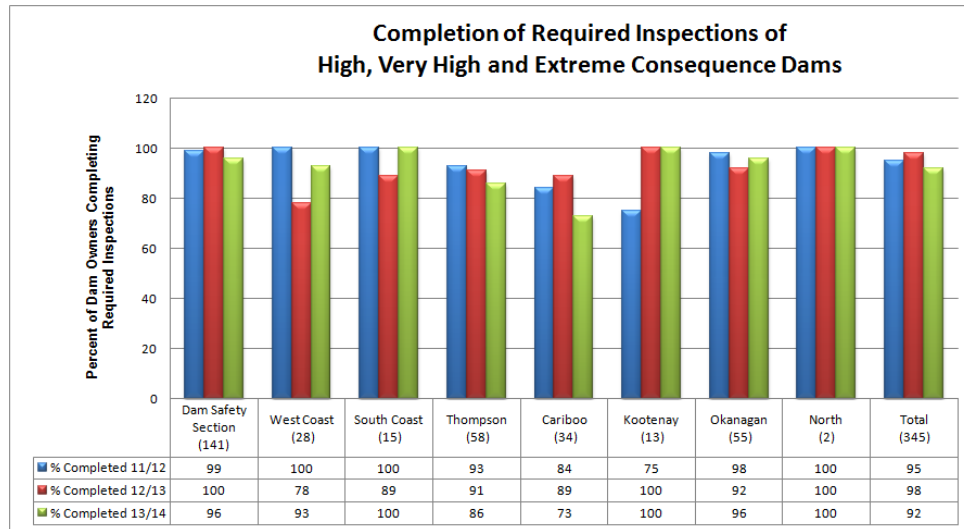


Figure 3: Percent of dam owners who returned their compliance forms and indicated they had completed the required annual dam inspections. (Note: numbers in brackets are the total number of dams for each administrative unit in 2013/14.)

Dam owners of high, very high and extreme failure consequence classification dams are legally required to retain qualified engineers to conduct dam safety reviews. The reviews evaluate the safety of the dams and the dam owners' safety programs. Reviews are legally required to be submitted by the dam owner to the dam safety officer every seven years for extreme failure consequence classification dams and every 10 years for high and very high failure consequence classification dams. This requirement was introduced in the Regulation in 2000 and dam owners were given 10 years to have the first review completed. Despite being provided 10 years in which to complete their first dam safety review and annual notification since 2009, the number of dam safety reviews completed remained low until 2013/14 (Figure 4). As a result of a concerted effort by MFLNRO staff, almost every administrative unit now has more than 59% of dams where dam owners report completion of the legally required dam safety reviews. Provincially, the total reports of dam safety review completion were 65% of 346 dams last year compared to 50% of 339 dams the year before. The lower number of dam owners completing their reviews in the Cariboo reflects the ministry's challenges in staffing the dam safety officer position in this region and highlights the key role dam safety officers play in ensuring compliance.

Data from the compliance reporting forms suggests that for the most part owners of high, very high and extreme failure consequence classification dams are compliant with the Dam Safety Regulation. However, the compliance report results still show around 35% of the 346 dams for which owners have not completed the required dam safety reviews. In summer 2012, compliance action was initiated with the owners of these dams. The resulting actions by the dam owners and dam safety officers over the last year are described in the section below on "Dam Safety Review Compliance and Enforcement."

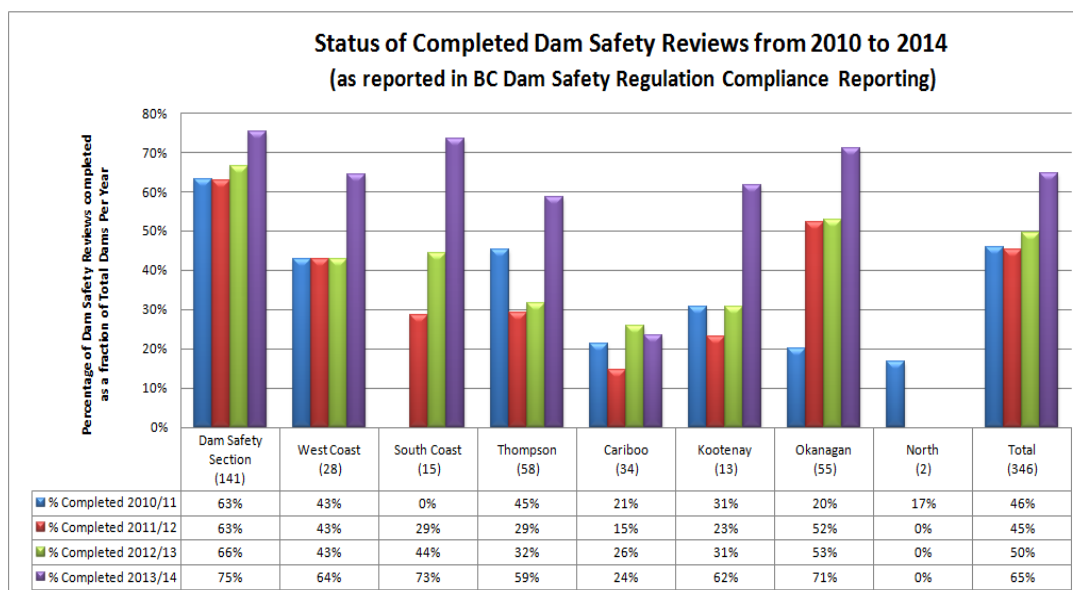


Figure 4: Percent of dam owners having dam safety reviews for their dams. (Note: numbers in brackets are the total number of dams for each administrative unit in 2013/14.)

Dam Safety Review Compliance and Enforcement

The Dam Safety Program in collaboration with the compliance and enforcement branch implemented a strategy in 2012 to encourage non-compliant dam owners to complete overdue dam safety reviews for their dams. All owners of each dam (some dams have multiple owners) were notified under the *Water Act* and given adequate time to respond to their dam safety officer on the status of the dam safety reviews. In November 2012, the dam owners were again reminded of the need for the dam safety review when they received their annual BC Dam Safety Regulation compliance reporting form. As a result of this initiative, 197 non-compliant owners of 133 dams were notified of the requirement by letter. The West Coast Region and North areas opted to contact non-compliant dam owners directly to encourage them to complete Dam Safety Reviews.

The status of the dam safety reviews which had been included in the non-compliance project, as of the end of April 2014, is provided in Table 1. There are now 112 dams for which dam safety reviews are required. The difference from the previous assessment of 133 is attributed to dams which have been reclassified lower (from high failure consequence classification to significant), dams that are undergoing redesign/rehabilitation, dams under legal review and several that have been or are in the process of being decommissioned or removed. The dam safety review compliance and enforcement project will continue until all dam owners are compliant.

Table 1: Status of dam safety reviews in 2013/14 for dams identified as requiring dam safety reviews.

Status	MFLNRO Administrative Areas								Total
	Dam Safety Section	West Coast	South Coast	Thompson	Cariboo	Kootenay	Okanagan	North	
Not Started	1	0	0	2	3	1	1	0	8
Started/Work in Progress	4	8	0	27	12	1	3	1	56
Submitted to DSO/Reviewed by DSO	4	8	0	0	6	2	0	0	20
More work needed/Rejected by DSO	0	0	0	0	1	3	7	0	11
Accepted by DSO	1	0	3	4	5	2	2	0	17
Total	10	16	3	33	27	9	13	1	112

Dam Audits

Under the dam audit program, dam safety officers meet with dam owners and conduct a dam audit at least once every five years for high, very high and extreme failure consequence classification dams and at least once every 10 years for significant failure consequence classification dams. The audits are an opportunity for dam safety officers to meet with dam owners, review the records being kept and visit the dams with the dam owner. These audits help confirm if the dam owner is aware of and is carrying out requirements under the Regulation. If deficiencies are found staff can provide information to help the dam owner address the problem. When necessary, follow-up is done by dam safety officers to ensure that any identified are corrected. Each dam safety officer has a target number of audits to complete annually to ensure that all dam audits will be completed within the required time frame.

In 2013/14, dam safety officers and other trained staff completed 160 audits. This exceeded the scheduled target of 127 dam audits (Figure 5). Most dam safety officers were able to meet or exceed their target, in some cases making up for previous years when targets were not met. In terms of percentages, Cariboo and West Coast regions exceeded their targets by 88% and 40% respectively. Overall, the provincial target was exceeded by 26%. An increase in dam audits is often attributable to efficiencies gained when a large number of dams belonging to one dam owner are completed together, or when a number of dams within the same geographic area are audited at the same time. Target numbers can vary each year due to new dams added or existing dams deleted from the audit list, when consequence classification changes for a dam or dams are built or removed. As a result, the average number of dams over the audit period for different failure consequence classes is used. In some years, the target is not met and the shortfall is addressed in a subsequent year as is apparent with the Okanagan dams.

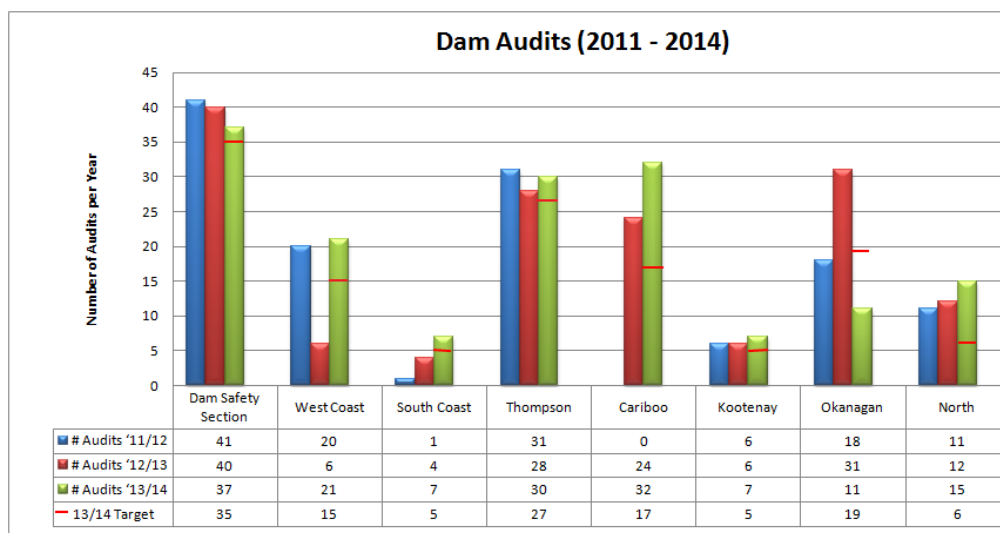


Figure 5: Number of audits completed by dam safety officers compared to the target number of audits for 2013/14.

Dam Project Reviews

Dam safety officers are involved in the review and approval of project plans for new dams and dams undergoing rehabilitation or removal. They then review the ongoing work during the design and construction phases of the projects. The following table summarizes the number of project reviews completed in 2013/14 by dam safety officers and the number of dams that are under construction either as new dams, dams being rehabilitated or dams being decommissioned (Table 2).

Table 2: Summary of project reviews and construction for dams in BC 2013/14.

Areas	New Dams ¹		Rehabilitation		Removal	
	Project Review	Construction	Project Review	Construction	Project Review	Construction
Dam Safety Section (Major Dams >9m high)	3	1	7	1	9	1
West Coast	0	0	1	1	0	1
South Coast	10	0	3	2	1	1
Thompson	0	1	4	1	0	2
Okanagan	2	1	1	1	1	1
Kootenay	1	0	0	2	2	0
North	1	0	2	0	0	1
Cariboo	1	0	1	0	2	2
Total	18	3	19	7	14	9

¹ Includes increasing the height of a dam to create additional storage.

Dam Registry

The dam registry is comprised of two separate but linked digital information systems. One is a database management system referred to as E-licensing that houses textual data records of dams. The other provides geospatial data to map viewers such as Google Earth and iMap to depict dam information spatially. The dam registry is available to internal government users only. [Google Earth and Data BC](#) products, which show the location of 81% of the dams in BC, are available to the public.

Accuracy of dam information is important not only for managing clients but also for reporting on the state of dams in the province and for rapid access to information during emergencies. Consistency and accuracy of data entry into the dam registry and ensuring that information is current remains an ongoing activity for the Dam Safety Program.

In 2013/14, significant effort was made to improve the E-licensing component of the dam registry. For example, concurrent with increased compliance and enforcement activities, dam safety officers determined there was a need to record information in the registry about dam owner compliance and enforcement. As a result, there have been substantial changes made to better track dam owner compliance with dam safety reviews. Supporting documents can now be uploaded into the dam registry and are accessible to ministry staff online anywhere in the province.

With the increase in the number of dams entered into the Dam Registry over the last two years, there is a need to ensure that the spatial locations of the dams are recorded. Of the total number of dams in the Dam Registry, 81% have associated spatial information. There still exist 413 dams which cannot be viewed on Google Earth or DataBC. Fifty-nine percent of these are identified as operational dams. Spatial data for the remaining dams is updated as opportunities arise.

Continued work with E-licensing and the data warehouse is planned in 2014/15 to further improve the management of dam information and make the databases more responsive to the needs of dam safety officers. These revisions will help create a more robust registry that will provide useful, accurate and timely information.

Provincial Program Management

In addition to activities described in the sections above, there are a number of other accomplishments of the Dam Safety Program:

1. *Program Staffing:* The Dam Safety Program is comprised of the dam safety section (4.5 FTEs), water management branch in Victoria and regional senior dam safety officers who report through the ministry regional structure (4.57 FTEs). All areas of the province with a Dam Safety Program were fully staffed with a full-time or part-time dam safety officer except for the Cariboo region where the full-time dam safety officer left part-way through the year to take another position; the region recently filled the position. In several regions administrative staff, water stewardship and allocation staff, natural resource officers and other MFLNRO staff assisted dam safety officers with the dam safety review project, licensing updates, audits and audit follow-ups, dam site visits, dam registry updates and resolving locations of dams. In the West Coast region MFLNRO district engineers were trained to assist in the field portion of dam safety audits, reporting the results for interpretation and action.

2. *Communication:* The [Dam Safety Program website](#) has been updated to ensure that information on the B.C. Dam Safety Regulation, policies and other guidance and resource documents on dam safety are current and readily accessible by any user. The dam safety audit program policy has been updated to correct the risk level of the extreme failure consequence classification associated with a moderate failure probability rating. Prior to the spring freshet owners of high, very high and extreme failure consequence classification dams were notified of the need to ensure their dams were operating properly and maintained to allow the safe discharge of possible flood flows.
3. *Dam Safety Program Compliance and Enforcement:* The Dam Safety Compliance and Enforcement Strategy was completed in 2013/14. It documents the approach the Dam Safety Program will take to ensure dam owners are compliant with the *Water Act* and dam safety regulations by setting requirements for compliance, promoting compliance, verifying compliance and enforcing compliance. The compliance and enforcement branch is a key partner in the delivery of the enforcement side of this strategy. Procedures will be included with the strategy which will define the roles and responsibilities of dam safety officers, natural resource officers and other dam safety staff. To support the strategy and procedures, a policy on dam safety compliance and enforcement will be developed in 2014/15 to provide guidance to dam safety staff and natural resource officers.

Dam Incidents

Whenever an incident about a dam is reported to the ministry, a dam safety officer or other staff person will immediately respond, sometimes with support from regional compliance and enforcement staff. The dam owner is contacted and depending on the seriousness of the situation other agencies, including Emergency Management BC, may be contacted. These investigations are logged in incident reports. The following is a summary of dam incidents reported in 2013/14:

Dam Failures

Two dam failures were reported in 2013/14, one in the Okanagan region and the other in the South Coast region.

1. *Gleaner Creek North Dam* (D220129-00): On April 4, 2013, an unregulated dam west of Oliver failed. The released water destroyed the owner's four hectare cherry orchard and parts of Fairview Road and deposited debris on a neighbour's property. The dam did not have a spillway, nor was it constructed to current standards. Based on site measurements the reservoir volume was estimated at 3,000 cubic metres and the dam height was 8.6 metres and should therefore have been regulated.
2. *Lost Lake Dam:* On February 22, 2014, an old log crib dam near Powell River failed, lowering the water level of Lost Lake (Figure 6) and damaging riprap protection of a downstream forestry bridge and a recreational bridge. The dam safety officer will determine if the dam was authorized through a water licence and the ownership of the dam. Further action may be necessary to ensure that the breach does not close due to beaver activity.



Figure 6: Breach on a dam overlooking the Lost Lake Reservoir.

Dam Alerts

There were two dam alerts reported in 2013/14. A dam alert occurs when an abnormal condition is observed at a dam or a dam performs abnormally and, without swift and effective intervention, failure may occur.

1. *Duteau Creek Intake – Headgates Dam (D240239-00)*: On June 21, 2013, the Regional District of North Okanagan reported that the reservoir behind a Greater Vernon Water District dam on Duteau Creek, southwest of Lumby was reaching very high water levels. The significant failure consequence classification dam was designed for a 15 inch over-top flow but was experiencing a 26 inch over-top flow with a spillway wall freeboard of 10.5 inches. Although the water was high (Figure 7), no structural failure was observed. The dam was monitored by the Regional District during this period with no further incidents. Had the dam breached, the owner had a strategy in place to notify downstream residents. The water district was found not in compliance with the dam safety regulation for the hazard at the dam. A consultant engineer was retained to develop plans to address extreme water flows of this type in the future.



Figure 7: Aerial view of high water levels associated with overtopping of Headgates Dam.

2. *Elko dam* (D320001-00): On June 21, 2013, BC Hydro reported that the significant failure consequence classification dam near Elko was threatened by peak water flows on the Elk River (Figure 8). The two gates of the dam were fully opened. It was known that the spillway capacity was inadequate for large storms but it was not expected the dam would fail. There was no anticipated threat of loss of lives or to the Highway 93 bridge located 16 kilometres downstream of the dam. The worst case scenario was a 15% chance of the loss of the dam abutments, which did not occur. By June 23, the facility was reported as stabilized after BC Hydro crews diverted water and minimized further damage. During the event, BC Hydro took action to ensure the downstream area was clear of people.



Figure 8: High water levels on the Elko River overtopping Elko Dam.

Dam Incidents

There was one dam incident reported in 2013/14. A dam incident occurs when an abnormal condition is observed at a dam or the dam performs abnormally but the condition is not expected to lead to a failure of the dam.

1. *Isintok Lake Dam* (D220000-00): On September 10, 2013, the District of Summerland reported that during an inspection significant leakage under pressure was observed at one location in the low level outlet pipe of the high failure consequence classification dam on Canyon Creek near Summerland (Figure 9). The reservoir was lowered and a low permeability layer was constructed around the pipe inlet. The proposal was to pressure-grout around the leaky joints. The District and the consultant are waiting for a freshet to refill the reservoir again to determine if the repair was adequate. They will monitor the outlet during filling and if it does not work, they will drain the reservoir.



Figure 9: Leak in low level outlet pipe in Isintok Dam.

No Dam Incident

This term is used for reports that are initially received as dam incidents but do not impact the safety of a dam. This could be an erroneous report or a report about an abnormal condition that could be interpreted as a threat to a dam. There were two reports classified as “No Dam Incidents” in 2013/14.

1. *Sasamat Lake Dam* (D240202-00): A dam on Sasamat Lake outside of the regional park in Port Moody was reported at the time of the incident as having minor concerns in 2013/14. Subsequently, a consultant assessed the dam and found no issues with it. The dam is now listed in the dam registry, classified as a high failure consequence and the owner has applied for a licence.
2. *Jacko Lake Dam* (D120211-00): On April 24, 2013, a report was received regarding a crack along the outlet channel of this very high failure consequence classification dam. The dam safety officer confirmed in a site visit that there was no crack in the dam, or the bank of the outlet channel. The observed “crack” was a shallow (<10cm) trench which contained instrumentation wiring for stream data logging. It did not pose a threat to the integrity of the channel bank or dam.

Conclusion

In 2013/14, MFLNRO continued to make substantial progress in a number of areas in the Dam Safety Program, upholding the commitment to deliver on the recommendations contained in the review of the Testalinden Dam failure in 2010.

In several areas of the province, dam owners or their representatives were offered training in dam safety and many attended the workshops. Dam safety and other MFLNRO staff have also received training about current dam safety practices, enhancing their ability to assist dam owners in complying with the regulations. Staff have continued to improve technical guidance documents for dam owners and their consultants to assist in Dam Safety Reviews and plan submissions; this will ensure consistency with the requirements of dam owners across the province. Some dam safety staff advanced their knowledge of dam safety practices by attending conferences offered by professional associations in other jurisdictions. This knowledge is shared internally at community of practice and technical training workshops for dam safety officers.

The dam safety review compliance strategy launched in summer 2012 has produced positive results to date. The number of dam owners who have hired professional engineers to undertake dam safety reviews has increased.

More dam safety audits were conducted in the 2013/14 reporting period than in the previous year. Dam safety officers have responded to reported dam incidents which included dam failures, dam alerts, dam incidents and situations that proved not to be issues (non-incidents).

A large return of the dam inspection compliance forms continued this year but timeliness of the results could have been better. Ministry staff will work to improve this during 2014/15. A high percentage of owners of high, very high and extreme failure consequence classification dams reported conducting formal inspections. Ongoing improvements to the internal dam registry will enable dam safety officers to use the registry to track regulatory compliance by dam owners and enforcement activity where applicable.

B.C. Dam Safety Program
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